

## T02D05 – (12.1) Electron Configuration and Box Diagrams

Name \_\_\_\_\_

1. 12.1.1 Explain how evidence from first ionization energies across periods accounts for the existence of main energy levels and sub-levels in atoms. (3)
- a. Define the 1<sup>st</sup> Ionization Energy:

- b. What factors affect ionization energy:

Factor	Explanation

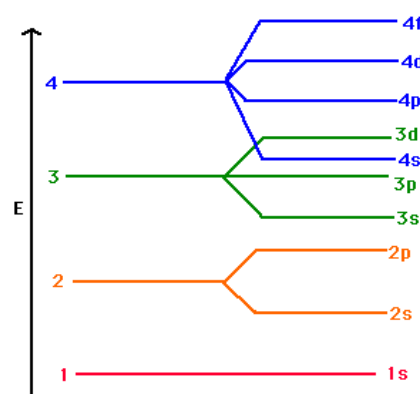
2. 12.1.2 Explain how successive ionization energy data is related to the electron configuration of an atom. (3)
- a. This topic will be revisited in periodicity

3. 12.1.3 State the relative energies of s, p, d and f orbitals in a single energy level. (1)

- a. What is the principle energy level?

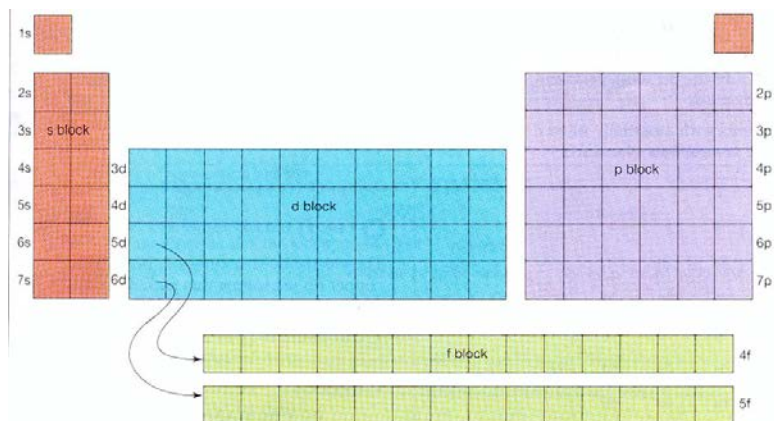
- b. How many sub-levels (orbitals) are there in each energy level?

Principle Energy Level	Number of Sub-levels



4. 12.1.4 State the maximum number of orbitals in a given energy level. (1)

Sub-level	Max # Orbitals	Max # Electrons



5. 12.1.5 Draw the shape of an s orbital and the shapes of the px, py and pz orbitals.

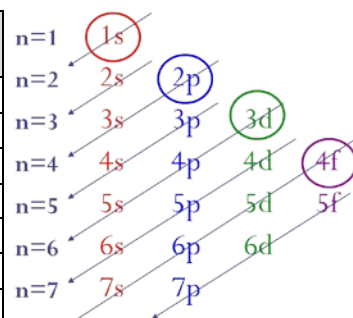
Shape (sublevel)					
s		x	x	x	x
p				x	x
d					

6. 12.1.6 Apply the Aufbau principle, Hund's rule and the Pauli exclusion principle to write electron configurations for atoms and ions up to  $Z = 54$ . (2)

- How is the electron configuration written (what do the numbers and letters mean)?
- Define the Aufbau Principle:
- Write the order of orbital filling starting with  $1s \rightarrow 7p$

- d. Write electron configurations for each, pay attention to the exceptions:

Element (neutral)	Electron Configuration
H	
C	
O	
Al	
Cu	
F	
Cr	



- Electron Configuration of ions:
  - Example of when a positive ion is formed (Na):
  - Example of when a negative ion is formed (O):
- Electron Configuration of transition metals:
  - Which electrons do transition metals lose first?
  - An example of Titanium:
  - An example of Chromium:

Ion	Electron Configuration
$Mg^{2+}$	
$Ca^{2+}$	
$Al^{3+}$	
$Cl^-$	
$Br^-$	
$P^{3-}$	

- g. Orbital Box Diagrams:
- Define Hund's Rule:

- Define the Pauli Exclusion Principle:

- Give the orbital box diagram and electron configuration for the following:

Element	Electron Configuration	Orbital Box Diagram
Li		
F		
K		
N		
O		